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ABSTRACT

A Teacher Survey was developed for administration to Illinois teachers whose students take the Illinois Inventory of Educational Progress (IIEP). The IIEP are the achievement tests of the state assessment program. The purposes of the Teacher Survey range from determination of a test's curricular validity to investigations of teachers' abilities to predict student performance. Teachers were asked to respond to these four questions concerning items on the IIEP: (1) To what extent have students been exposed to the content of this item? (2) How well does this item measure the content you are teaching? (3) How difficult is this item? and (4) What percentage of your students will get this item correct? Means analysis and inspection were performed on the data. Comparisons were made between the teachers' predictions and student performance on each item. In regard to the original four questions, the data indicated that the tests had curricular validity, evidenced content validity, and were of easy to moderate difficulty level. However, research on the Teacher Survey is very incomplete. The present data indicate that an individual teacher's estimates at a level greater than his/her own students are more likely to be in error than to be accurate. Several tables showing teacher underestimates and overestimates and standard deviations are included. (DWH)

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Are Teachers Good Predictors of School Level or Statewide Level of Student Performance?

by
Mervin M. Brennan
and
Kenneth R. Redding

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Presentation at the Annual Meeting
of the American Educational Research Association
Chicago, Illinois, April 4, 1985

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People's judgment of others has been a slippery fascination of human study and empirical research. Careful research has found human judgment and prediction more often in error than on target. Meehl (1954) concluded from a number of studies that success in graduate school was less well predicted by college professors than by statistical approaches. Tagiuri (1969) reviewed the research on person perception in social psychology and concluded that accurate judges of other people are extremely rare. Dawes (1971, 1979) reports on several reviews of the literature as well as his own studies, and concludes that no study has been found which shows clinical prediction to be superior to statistical prediction.

The studies reported in this paper are part of an ongoing project involving questionnaires answered by Illinois teachers whose students take the Illinois Inventory of Educational Progress. The Illinois Inventory of Educational Progress are the achievement tests of the state assessment program (which is administered to random samples of 4th, 8th, and 11th grade Illinois students each year). The purposes of this Teacher Survey range from determination of a test's curricular validity to investigations of teachers' abilities to predict student performance.

Travers and McKnight's (1985) three aspects of curriculum will be used to locate the Teacher Survey within a context. These aspects are:

Intended curriculum: The content which schools intend to cover in order for students to learn specific skills. Intended

curriculum is reflected in curriculum guides, course outlines, syllabi, and textbooks.

Implemented curriculum: The content/skills actually covered in classrooms. Classroom observation, teacher questionnaires, homework assignments and teacher-made tests are indicators of implemented curriculum.

Attained curriculum: Student accomplishment. Test scores, teacher evaluations and student projects are measures of attained curriculum.

The Teacher Survey was developed in reference to implemented curriculum. The initial and subsequent broadening stemmed from the following questions:

The original questions

1) Had the students been exposed to the material tested by the items? Did the items have curriculum validity?

2) Were the items good items? Did they really measure the contents they were supposed to measure, or in other words did they have content validity?

3) Were the items of an appropriate difficulty level? How difficult were the items?

4) What percentage of students did the teachers expect to get the item correct?

Additional subsequent questions

1) What was the pattern of underestimates and overestimates?

2) What model could be developed to best predict student achievement?

3) At what levels (student, school, state) were teachers' predictions accurate and inaccurate?

4) Are the questions appropriate

   a) for the initial purposes?

   b) for the subsequent purposes?

5) Should the questions be changed? Could they be made more appropriate

   a) for the initial purposes?

b) for the subsequent purposes?

c) for purposes we haven't considered?

6) Is it appropriate to request teachers to estimate student performance for their school?

7) Should the questionnaire ask teachers to

1) choose an average student they know who is taking the test?

2) answer these questions for their class in general?

3) answer these questions for their school in general?

8) Should we attempt to test intact classes and administer the teacher questionnaire for these classes?

9) Are the mentioned types of statistical analyses appropriate?

10) What types of additional statistical analyses may be more appropriate than those presently being pursued?

The results and discussion sections of this paper will relate our present status and thinking with regard to these questions.

History and Methodology. The Illinois Inventory of Educational Progress was first administered statewide in 1976. In 1977 questions arose as to the curricular validity of the tests. Were students being taught the material being tested? The second author developed the Teacher Survey to answer this and several related questions. The final 1977 version sought to (1) validate the test; (2) supply an additional perspective on the results; and (3) provide a standard of performance, based upon teacher estimates, with which student results could be compared.

Teacher Surveys were sent to every school which participated in the IIEP. Teachers were asked to answer these four questions for every item on the tests:

- To what extent have students been exposed to the content of this item?
- How well does this item measure the content you are teaching?
- How difficult is this item?
- What percentage of your students will get this item correct?

Table 1 [illegible] a sample Teacher Survey form.

The Teacher Survey has been administered in this form each year since 1978 with the exception of 1983 when other research was conducted. In 1980 questions were raised about the appropriateness of the Teacher Survey. Several staff suggested that meaningful teachers' predictions of students performance ought to be gathered on the student level rather than the school

Table 1

ILLINOIS STATE BOARD OF EDUCATION
Department of Planning, Research and Evaluation
Program Evaluation and Assessment Section
100 North First Street
Springfield, Illinois 62777

11th GRADE 1984 MATH ATTENDANCE CENTER TEACHER SURVEY

Part 1 — Geometry

(1) (2) (3)

INSTRUCTIONS: Starting with Column 1, indicate your response by placing a number corresponding to your opinion in the appropriate box. Return the form to your building principal when completed.

ITEM NUMBER	On a scale of 1 to 9 (1 - No Student Exposure; 9 - Heavy Student Exposure), TO WHAT EXTENT HAVE STUDENTS BEEN EXPOSED TO THE ITEM CONTENT? 1-9	On a scale of 1 to 9 (1 - Not at All; 9 - Very Well), HOW WELL DOES THE ITEM MEASURE THE CONTENT BEING TAUGHT IN 11th GRADE? 1-9	On a scale of 1 to 9 (1 - Very Easy; 9 - Very Difficult) INDICATE THE DIFFICULTY OF THE ITEM. 1-9	WHAT PERCENTAGE OF STUDENTS WILL ANSWER THIS ITEM CORRECTLY ___%
20				
21				
22				
23				
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28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				

ITEM NUMBER	On a scale of 1 to 9 (1 - No Student Exposure; 9 - Heavy Student Exposure), TO WHAT EXTENT HAVE STUDENTS BEEN EXPOSED TO THE ITEM CONTENT? 1-9	On a scale of 1 to 9 (1 - Not at All; 9 - Very Well), HOW WELL DOES THE ITEM MEASURE THE CONTENT BEING TAUGHT IN 11th GRADE? 1-9	On a scale of 1 to 9 (1 - Very Easy; 9 - Very Difficult) INDICATE THE DIFFICULTY OF THE ITEM. 1-9	WHAT PERCENTAGE OF STUDENTS WILL ANSWER THIS ITEM CORRECTLY ___%
44				
45				
46				
47				
48				
49				
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63				
64				

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level. Four "teacher expectation" researchers were invited to Springfield as critics and consultants regarding the Teacher Survey. Thomas Good (University of Missouri), Chris Clarke (Michigan State University), and Richard Shavelson (University of California at Los Angeles) reflected with staff on the Teacher Survey at a two day meeting. George Madaus (Boston College) was unable to attend, but sent a paper offering critique and suggestions.

One suggestion of the four researchers was that teachers be asked to predict the performance each student taught by them on a subset of items for which there was historical Teacher Survey data. These students should be in their classes at the time they were taking the Illinois Inventory of Educational Progress. Such data could then be used as a cross validation of the Teacher Survey in its original form. A subset of 4th grade mathematics anchor items was chosen for this variation in the Teacher Survey and administered to teachers of the schools that participated in the 1981 Illinois Inventory of Educational Progress. The original teacher survey was used at the 8th and 11th grade levels. A summary of the comparative results of the two approaches is given in the results section which follows. The original Teacher Survey was administered as usual in 1982 and 1984.

Analysis Techniques. Means analysis and inspection were the principal analytic approaches used for the 1978-1982 data. Comparisons were made between the teacher predictions and student performance on each item. Mean teacher predictions and mean student performance for the tests as a whole

were compared. Difference scores on the original Teacher Survey were compared with difference scores on the "student by student" approach for each item and total test.

The 1984 data on general mathematics and geometry is being submitted to additional analysis, several of which are still in progress.

Data from teachers on student exposure, item validity, item difficulty, and predictions of student performance are being aggregated at the state level to provide the following global information by item and for the test as a whole: means, standard deviations, and ranges. Additionally, data files have been created by school so that each record contains the mean student performance on each test item and the Teacher Survey data for that school. Correlations are being computed between teacher predictions and student performance to test for significance and the amount of variance accounted for. Subsequently, the data will be submitted to multiple regression in an attempt to determine the relationships between student performance (dependent variable) and teacher estimates of exposure, content, difficulty, and predicted student performance. The first analyses will be for the tests as a whole, the clusters of items for which teachers overestimated student performance, underestimated performance, and accurately estimated performance.

Results. The results for the 1978-1982 Teacher Survey data are summarized briefly so that concentration can center on the 1984 results. Regarding the

four original questions it was designed to answer, the data indicated that the tests had curricular validity, evidenced content validity, and were of easy to moderate difficulty level. The overall means of teacher estimates were within 10 points of the student means. At the item level the teacher mean estimates were accurate for 60-75% of the items; teacher overestimates underestimates combined occurred on 25-40% of the items. Patterns of overestimation and underestimation appear to be similar across years. The results for the special 1981 "student by student" estimates do not appear to be different from the original survey data in aggregated form. However, Dr. Jack Fyans analyzed the "student by student" data further in a manner similar to the data reported in his presentation earlier in this session and found similar results in regard to similarity of aggregated results.

A complete subtest in geometry, as well as one in general mathematics, was administered in 1984. Analysis of each subtest in the manner of previous analyses returned similar results for the general mathematics tests and some interesting differences in regard to geometry. The 1984 Teacher Survey data indicated the following in regard to the original 4 questions:

Teachers reported that the students had been adequately exposed to the general mathematics test items, that these items measured the content very well, and that most of the items were toward the easy side of the scale with only a few rated moderately difficult. Table 2 shows the overall averages of teacher estimates and actual student performance for the general mathematics tests.

Table 2. Teacher Estimates and Student Performance in General Mathematics

MEAN SCORES

Grade	Teacher Estimate	Student Performance	Difference
4	63%	60%	+3
8	68%	57%	+11
11	62%	59%	+3

Geometry was thought to be less emphasized in the elementary grades than general mathematics, a hypothesis that was confirmed by the survey data.

Teachers reported that fourth grade students had generally not been exposed to the content of geometry at all, while eighth and eleventh grade students had been. Teachers judged the fourth grade geometry test to be somewhat difficult overall; the eighth grade test to be average; and the eleventh grade test to be somewhat easy. Table 3 displays the averages of teacher estimates and actual student performance for the geometry tests.

Table 3 Teacher Estimates and Student Performance on the Geometry Tests

MEAN SCORES

Grade	Teacher Estimate	Student Performance	Difference
4	27%	36%	-9
8	46%	40%	+6
11	60%	51%	+9

The aggregate mean estimates in both general mathematics and geometry are reasonably accurate just as they were in previous years. The Teacher Survey data appeared to indicate that the tests had curricular validity (except in fourth grade geometry, as anticipated), evidenced content validity, were of appropriate difficulty, and supported the original permise that student performance is similar to teacher expectations.

However, the item level results present a different picture in regard to teacher estimates of student performance. Tables 16 to 21 in Appendix A show the comparative results for the six subtests in general mathematics and geometry at grades 4, 8, and 11. For the present, however, it will be more useful to focus on the teachers' underestimates and overestimates of student performance in an attempt to answer our first "subsequent" question as to whether there are patterns in these estimates. And yes, there appear to be patterns, biases in the teachers' judgments, which can be identified.

Fourth grade teachers underestimated their students' ability to answer geometry questions which require common sense and general knowledge developed outside school. On the other hand, they overestimated their students' ability to handle a logic problem. See Tables 4 and 5 for the summary data and display of sample test items.

See page 16 for Table 4
See pagees 17 and 18 for Table 5

A similar pattern of underestimation and overestimation occurs in 4th grade general mathematics. Teachers underestimated student ability to use common sense, general knowledge, and intuitive judgment. Teachers overestimated their students' ability to retain classroom content and apply it to solve problems. Tables 6 and 7 show the summary data and the test items.

See page 20 for Table 6
See pagees 21 and 22 for Table 7

Eighth grade teachers underestimated their students' ability to use life experience, intuition, and common sense to solve geometric problems not emphasized in the classroom. They overestimated their students' understanding of area, perimeter, and volume as well as their ability to use classroom taught knowledge to solve problems. They did not underestimate students significantly on any general mathematics item, but overestimated their ability on quite a few items related to material reviewed heavily in class, particularly those on fractions and decimals and those requiring logical thinking and problem solving. Tables 8-11 display the summary data and the items.

See page 23 for Table 8
See pages 24 - 27 for Table 9
See page 28 for Table 10
See page 29 for Table 11

Eleventh grade teachers underestimated their students' intuitive ability to estimate comparative amounts of space in a geometric figure while overestimating their ability to recall and apply knowledge covered in a geometry class. They underestimated student's mathematical ability, while overestimating their abilities to deal with area, fractional relationships, and problem solving. Tables 12-15 show the summary data and actual items.

To this point, we have concentrated on the central tendencies of the data, but it is the measures of variability that may yield greater understanding of it. Inspection of Tables 16-21 contain columns which give the standard deviations of the teachers' estimates for each test item (labeled Teacher Estimate S.D.). These standard deviations are quite large and indicate that the teachers' estimates were quite diverse. In fact, the range of estimates was from 10% correct to 90% correct or greater on almost all items of the tests.

Additional exploratory analysis is now underway to explain the large variation in estimated student scores. The first set of additional analyses are correlational. Under the hypothesis that teachers of low achieving students may have estimated low scores, while teachers of high achieving students may have estimated high scores, correlations were computed between teacher estimates and student scores. This was done "by school" for each test item. Results indicate that 4% of the variance in student scores was

predicted by the teachers, while 96% of the variance is accounted for by errors in prediction. Table 22 displays the correlation coefficients, proportion of predicted variance, and proportion of error variance.

Discussion. The research on the Teacher Survey is very incomplete at this time. The study by Fyans (1985) suggests that teachers are good judges of how well their students will do on test items. The aggregated mean estimates of teachers over 40 item subtests are rather close to the aggregated means of students performance on those tests. These results at first suggest that teachers are good predictors of student's performance.

However, other statistical results suggest that in predicting for their schools teachers may be poor predictors of student performance. On more than a few items the teachers' mean estimates are considerably higher or lower than student performance. Additionally the range of teachers' estimates is extremely large, to the point of almost covering the entire scale. Finally, when estimating the scores for their own schools teachers' estimates did not correlate highly with their schools' performance.

What the remaining analyses will render is speculation at this point. Perhaps, some explanation will become clear. But if it does not, it would appear from the present data that an individual teacher's estimates at a level greater than his own students (perhaps his own class(es)) are far more likely to be in error than to be accurate. The approximate accuracy of the

aggregated overall means is more probably an artifact of the central tendency of "means of means" and the accompanying phenomenon of the smaller "standard error of the mean".

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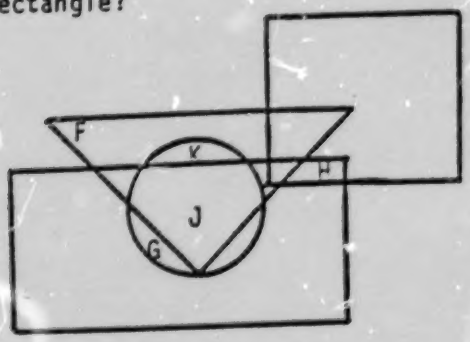
Table 4: Teacher Estimates of Student Performance in Fourth Grade Geometry: Underestimates and Overestimates

1984 Geometry Grade 4									
Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
UNDERESTIMATES									
21	37	67	-30	30	33	26	43	-17	28
24	36	58	-22	30	36	36	59	-23	31
30	21	72	-51	25	39	26	36	-10	27
31	20	53	-33	21	40	23	57	-34	26
OVERESTIMATE									
28	28	08	+20	26					

Table 5: Sample items of Teacher Underestimates and Overestimates in Fourth Grade Geometry.

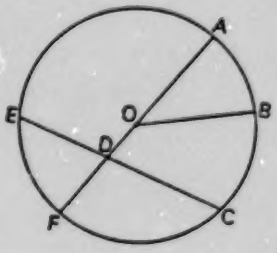
21. Which letter in the figure below is inside both the triangle and the rectangle?



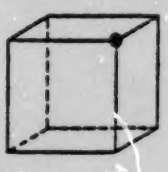
A. F	A. 11.1%
B. G	B. 5.8%
C. H	C. 11.2%
D. J	D. 66.8%
E. K	E. 4.9%
	Nonresponse .2%

33. In the circle below, with center O, which line segment represents the radius?

A. $\overline{CD}$	A. 7%
B. $\overline{AF}$	B. 25%
C. $\overline{EC}$	C. 16%
D. $\overline{DE}$	D. 8%
E. $\overline{OB}$	E. 43%
	Nonresponse: 0.0%



36. There is a dot on one of the corners of the cube below. How many corners does the cube have?



A.	4	A.	15%
B.	6	B.	7%
C.	7	C.	15%
D.	8	D.	59%
E.	16	E.	4%
		Nonresponse:	.2%

28. Which one of the following statements is TRUE?

A.	All rectangles are squares.	A. 8.4%
B.	All squares are rectangles.	B. 8.0%
C.	No squares are rectangles.	C. 18.1%
D.	No rectangles are squares.	D. 12.9%
E.	Some squares are not rectangles.	E. 51.9%
		Nonresponse: .5%

Table 6: Teacher Estimates of Student Performance in Fourth Grade General Mathematics: Underestimates and Overestimates

1984 General Mathematics Grade 4

Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
					UNDERESTIMATES				
107	73	85	-12	18	128	40	63	-23	29
111	71	80	-9	21	138	34	43	-9	28
					143	72	83	-11	26
					OVERESTIMATES				
108	73	61	+12	21	129	49	36	+13	24
110	73	57	+16	19	139	80	69	+11	45
121	78	49	+29	16	140	77	47	+30	19
122	44	12	+32	25	141	52	26	+26	29

Table 7: Sample items of Teacher Underestimates and Overestimates in Fourth Grade General Mathematics.

107. If you spent 72 cents, how much change should you get back from one dollar?

A. 8 cents	A. 3%
B. 14 cents	B. 5%
C. 16 cents	C. 8%
D. 28 cents	D. 85%
	Nonresponse: .3%

128. Four and two-fifths may be written as

A. $\frac{42}{5}$	A. 10%
B. $\frac{4}{25}$	B. 13%
C. $4\frac{2}{5}$	C. 63%
D. None of these	D. 13%
	Nonresponse: .6%

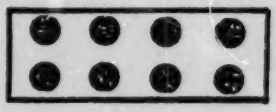
111. Sally worked from 4:30 p.m. to 5:00 p.m. How many minutes did she work?

A. 30 minutes	A. 80%
B. 35 minutes	B. 4%
C. 40 minutes	C. 4%
D. 45 minutes	D. 12%
	Nonresponse: 4%

121. Subtract: $4.21
- 2.17

A.	$214	A. 7%
B.	$204	B. 32%
C.	$2.04	C. 49%
D.	$2.14	D. 12%
		Nonresponse: .4%

122. If one-fourth of the dots in the figure below are taken away, how many dots will be left?



A.	4 dots	A. 65%
B.	5 dots	B. 5%
C.	6 dots	C. 12%
D.	7 dots	D. 15%
		Nonresponse: .4%

140. John has 385 stamps in his stamp collection. Greg has 230, Pete has 310 and Bob has 175. The number of stamps the boys have all together is

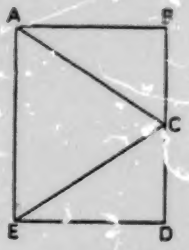
A.	900 stamps.	A. 20%
B.	1,000 stamps.	B. 16%
C.	1,100 stamps.	C. 47%
D.	1,200 stamps.	D. 17%
		Nonresponse: .3%

Table 8: Teacher Estimates of Student Performance in Eighth Grade Geometry: Underestimates and Overestimates

1984 Geometry					Grade 8				
Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
					UNDERESTIMATES				
23	68	84	-16	23	34	52	73	-21	27
28	61	86	-25	26	54	44	58	-14	27
					61	30	43	-13	26
					OVERESTIMATES				
24	69	38	+31	22	41	51	34	+17	26
30	37	20	+17	26	43	53	21	+32	26
31	58	41	+17	23	44	54	40	+14	25
32	51	30	+21	28	45	29	15	+14	24
35	45	24	+21	26	46	49	20	+29	26
36	49	20	+29	24	48	34	18	+16	25
					49	53	28	+25	26

Table 9: Sample items of Teacher Underestimates and Overestimates in Eighth Grade Geometry.

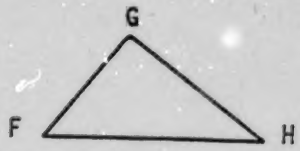
23. In the figure below, ABDE is a rectangle. Which segment is parallel to $\overline{DE}$?

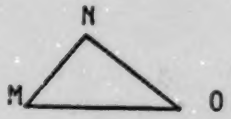


A.	$\overline{AC}$	A.	4%
B.	$\overline{AE}$	B.	6%
C.	$\overline{CE}$	C.	7%
D.	$\overline{AB}$	D.	84%
E.	$\overline{BD}$	E.	2%

Nonresponse: .04%

34. Given that the figures below are similar, the measure of angle F is the same as the measure of angle

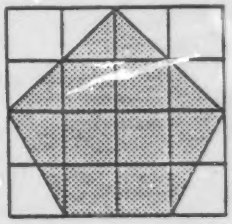




A.	$\angle G$	A.	7%
B.	$\angle H$	B.	7%
C.	$\angle M$	C.	73%
D.	$\angle N$	D.	7%
E.	$\angle O$	E.	6%

Nonresponse: .04%

54. ESTIMATE the area of the shaded figure in square units?



A. 8 square units

B. 10 square units

C. 12 square units

D. 14 square units

A.	11%
B.	58%
C.	11%
D.	18%
Nonresponse:	1.2%

24. Find the AREA of the following rectangle?

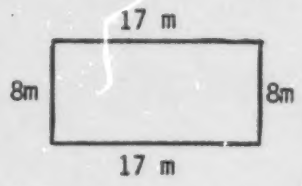
A. 25 m^2

B. 50 m^2

C. 68 m^2

D. 136 m^2

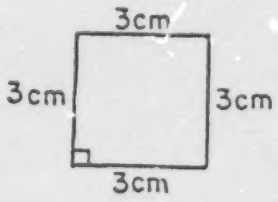
E. 289 m^2



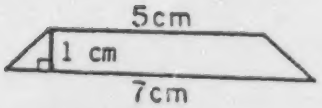
A.	6%
B.	46%
C.	5%
D.	38%
E.	5%
Nonresponse:	0%

49. Which polygon below has an area of 12 square centimeters?

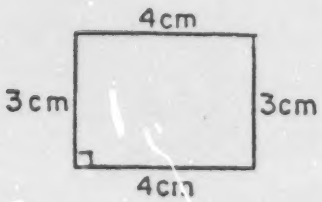
A.



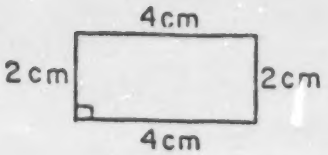
B.



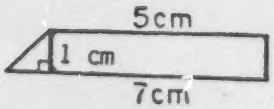
C.



D.



E.



A.	49%
B.	6%
C.	28%
D.	13%
E.	3%
Nonresponse:	0%

36. What is the area of the circle below with a radius of 4? (let $\pi = 3.14$)

A. 6.23

B. 12.56

C. 25.12

D. 50.24

E. 57.25

A. 8%

B. 52%

C. 17%

D. 20%

E. 2%

Nonresponse: 0%

Table 10: Teacher Estimates of Student Performance in Eighth Grade General Mathematics: Underestimates and Overestimates

1984 General Mathematics Grade 8

Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
					UNDERESTIMATES				
NONE									
					OVERESTIMATES				
134	77	51	+26	15	157	75	52	+23	15
135	55	35	+20	22	160	68	41	+27	19
136	64	34	+30	21	163	71	39	+32	19
140	71	26	+45	17	165	56	30	+26	24
142	81	54	+27	15	166	70	52	+18	19
143	56	42	+14	21	167	72	55	+17	18
147	51	27	+24	23	168	70	47	+23	20
148	77	49	+28	16	171	54	35	+19	24
156	66	42	+24	22	174	56	38	+18	22

Table 11: Sample items of Teacher Overestimates in Eighth Grade General Mathematics.

140. Which of these fractions is the LARGEST?

A. $\frac{2}{3}$	A.	29%
B. $\frac{3}{4}$	B.	13%
C. $\frac{4}{5}$	C.	26%
D. $\frac{5}{8}$	D.	32%
	Nonresponse:	.3%

148. Add: $\frac{1}{2} + \frac{1}{3}$

A. $\frac{1}{5}$	A.	10%
B. $\frac{2}{5}$	B.	29%
C. $\frac{2}{6}$	C.	11%
D. $\frac{5}{6}$	D.	49%
	Nonresponse:	.04%

163. Which of the following is NOT correct?

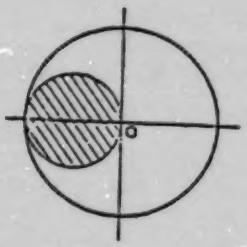
A. $\frac{65}{100} = 0.65$	A.	5%
B. $\frac{2}{4} = 0.5$	B.	50%
C. $\frac{1}{10} = 0.1$	C.	6%
D. $\frac{70}{100} = 0.07$	D.	39%
	Nonresponse:	.3%

Table 12: Teacher Estimates of Student Performance in Eleventh Grade Geometry: Underestimates and Overestimates

1981 Geometry					Grade 11				
Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
UNDERESTIMATE									
45	41	67	-26	21					
OVERESTIMATES									
21	62	29	+33	23	36	52	35	+17	24
22	61	38	+23	21	37	63	44	+19	24
24	72	39	+33	21	40	67	51	+16	24
29	64	37	+27	22	47	62	49	+13	23
30	69	58	+11	23	48	63	42	+21	22
32	63	49	+14	24	50	41	20	+19	23
34	63	45	+18	23	54	57	36	+21	23
35	54	37	+17	23	57	52	29	+23	23
					64	59	43	+16	25

Table 13: Sample items of Teacher Underestimates and Overestimates in Eleventh Grade Geometry.

45. In the figure below, what fractional part of the large circle appears to be shaded?



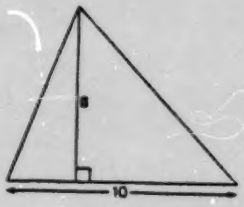
A.	$\frac{1}{8}$	A. 8%
B.	$\frac{1}{6}$	B. 12%
C.	$\frac{1}{4}$	C. 67%
D.	$\frac{1}{3}$	D. 9%
E.	$\frac{1}{2}$	E. 4%
		Nonresponse: 0%

21. What is the area of the circle below with a radius of 4? (let $\pi = 3.14$)

A.	6.23	A.	5%
B.	12.56	B.	54%
C.	25.18	C.	12%
D.	50.24	D.	29%
E.	57.25	E.	1%

Nonresponse: .04%

29. What is the area of the triangle shown below?



A.	9	A.	2%
B.	18	B.	20%
C.	20	C.	6%
D.	40	D.	37%
E.	80	E.	38%

Nonresponse: 0%

50. A box has a volume of 100 cm^3. Another box is twice as long, twice as wide and twice as high. What is the volume of the second box?

A.	200 cm^3	A.	48%
B.	450 cm^3	B.	8%
C.	500 cm^3	C.	5%
D.	600 cm^3	D.	18%
E.	800 cm^3	E.	20%

Nonresponse: .04%

Table 14: Teacher Estimates of Student Performance in Eleventh Grade General Mathematics; Underestimates and Overestimates

1984 General Mathematics Grade 11									
Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
UNDERESTIMATES									
141	61	86	-25	24	173	57	77	-20	21
164	63	75	-12	19	177	53	64	-11	20
171	49	73	-24	23	183	38	64	-26	23
					186	61	80	-19	24
OVERESTIMATES									
139	70	36	+34	12	165	54	37	+17	22
143	70	48	+22	18	167	59	46	+13	20
145	78	58	+20	16	169	64	52	+12	20
147	58	45	+13	20	170	61	49	+12	19
149	69	48	+21	19	172	66	54	+12	18
152	78	63	+15	17	176	58	31	+27	21
154	73	60	+13	19	182	59	46	+13	23
156	69	54	+15	18	184	49	30	+19	23

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Table 15: Sample items of Teacher Underestimates and Overestimates in Eleventh Grade General Mathematics.

171. If $a + 3 = b$ and $3 + c = b$, then

A.	a is less than c.	A. 5%
B.	a is equal to c.	B. 73%
C.	a is greater than c.	C. 5%
D.	there is not enough information to determine the relation between a and c.	D. 16%
	Nonresponse:	.3%

183. Three friends go through the same lunch line. In how many different ways can they arrange themselves in the line?

A.	3	A. 21%
B.	4	B. 6%
C.	5	C. 8%
D.	6	D. 64%
	Nonresponse:	.7%

186. Lynn was paid $15 for one week mowing lawns. What other information is needed before you can find out how much Lynn charges per hour?

A.	Lynn worked 2 hours on Monday and 3 hours on Wednesday.	A. 80%
B.	Lynn paid $1.00 to have the lawn mower fixed and 50¢ for gas.	B. 9%
C.	Lynn earned more this week than last week.	C. 8%
D.	Lynn spent 90¢ on ice cream cones.	D. 3%
	Nonresponse:	.4%

139. Which fraction is the largest?

A.	$\frac{2}{3}$	A. 30%
B.	$\frac{3}{4}$	B. 20%
C.	$\frac{4}{5}$	C. 36%
D.	$\frac{5}{8}$	D. 13%
		Nonresponse: .2%

143. There are 13 boys and 15 girls in a group. What fractional part of the group is boys?

A.	$\frac{13}{28}$	A. 48%
B.	$\frac{15}{28}$	B. 8%
C.	$\frac{13}{15}$	C. 38%
D.	$1\frac{2}{13}$	D. 5%
		Nonresponse: .04%

149. Multiply: $4 \times 1\frac{5}{6}$

A.	$4\frac{5}{6}$	A. 32%
B.	$5\frac{5}{6}$	B. 11%
C.	$7\frac{1}{3}$	C. 48%
D.	$\frac{11}{24}$	D. 9%
		Nonresponse: .04%

Table 16: Standard Deviations for Teacher Estimates in Fourth Grade Geometry

1984 Geometry Grade 4									
Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
19	41	54	-13	32	31	20	53	-33	21
20	33	27	+6	30	32	28	22	+6	27
21	37	67	-30	30	33	26	43	-17	28
22	29	34	-5	30	34	20	06	+14	25
23	40	48	-8	31	35	20	33	-13	25
24	36	58	-22	30	36	36	59	-23	31
25	26	31	-5	26	37	21	08	+13	26
26	28	34	-6	28	38	20	26	-6	23
27	44	44	0	31	39	26	36	-10	27
28	28	08	+20	26	40	23	57	-34	26
29	24	33	-0	27	41	24	21	+3	26
30	21	72	-51	25	42	25	24	+1	26
					43	13	27	-14	19
					44	20	18	+2	24
					45	23	27	-4	27

Table 17: Standard Deviations for Teacher Estimates in Fourth Grade General Mathematics

1984 General Mathematics Grade 4

Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
104	79	74	+5	17	121	78	49	+29	16
105	75	71	+4	19	122	44	12	+32	25
106	83	79	+4	17	123	55	52	+3	30
107	73	85	-12	18	124	46	50	-4	29
108	73	61	+12	21	125	73	66	+7	20
109	78	75	+3	20	126	30	21	+11	26
110	73	57	+16	19	127	65	64	+1	22
111	71	80	-9	21	128	40	63	-23	29
112	80	84	-4	22	129	49	36	+13	24
113	49	49	0	28	130	53	56	-3	26
114	78	71	+7	17	131	71	68	+3	25
115	75	76	-1	23	132	47	44	+3	26
116	56	61	-5	25	133	49	38	+9	24
117	88	86	+2	13	134	75	72	+3	22
118	52	48	+4	30	135	75	72	+3	20
119	58	68	-10	23	136	36	39	-3	28
120	50	56	-6	26	137	63	70	-7	23
					138	34	43	-9	28
					139	80	69	+11	45
					140	77	47	+27	19
					141	52	26	+26	29
					142	79	84	-5	21
					143	72	83	-11	26

Table 18: Standard Deviations for Teacher Estimates in Eighth Grade Geometry

1984 Geometry Grade 8									
Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
23	68	84	-16	23	41	51	34	+17	26
24	69	38	+31	22	42	67	61	+6	24
25	66	62	+4	23	43	53	21	+32	26
26	53	84	-31	27	44	54	40	+14	26
27	58	52	+6	27	45	29	15	+14	24
28	61	86	-25	26	46	49	20	+29	26
29	37	32	+5	26	47	35	31	+4	23
30	37	20	+17	26	48	34	18	+16	25
31	58	41	+17	23	49	53	28	+25	26
32	51	30	+21	28	50	32	29	+3	25
33	47	51	-4	25	51	39	21	+18	28
34	52	73	-21	27	52	27	29	-2	25
35	45	24	+21	26	53	31	21	+10	24
36	49	20	+29	24	54	44	58	-14	27
37	48	50	-2	26	55	40	24	+16	28
38	51	39	+12	25	56	37	27	+10	24
39	57	52	+5	27	57	31	27	+4	25
40	61	70	-9	25	58	33	28	+5	26
					59	39	51	-12	27
					60	24	25	-1	24
					61	30	43	-13	26

Table 19: Standard Deviations for Teacher Estimates in Eighth Grade General Mathematics

1984 General Mathematics Grade 8									
Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
130	86	90	-4	14	151	56	50	+6	27
131	74	67	+7	19	152	57	50	+7	24
132	88	93	-5	11	153	86	80	+6	13
133	67	76	-9	22	154	67	73	-6	28
134	77	51	+26	15	155	54	49	+5	27
135	55	35	+20	22	156	66	42	+24	22
136	64	34	+30	21	157	75	52	+23	15
137	80	76	+4	14	158	60	60	0	23
138	84	90	-6	12	159	65	58	+7	21
139	87	88	-1	12	160	68	41	+27	19
140	71	26	+45	17	161	57	52	+5	25
141	87	88	-1	11	162	44	34	+10	26
142	81	54	+27	15	163	71	39	+32	19
143	56	42	+14	21	164	76	62	+14	17
144	75	63	+12	21	165	56	30	+26	24
145	62	61	+1	24	166	70	52	+18	19
146	73	83	-10	17	167	72	55	+17	18
147	51	27	+24	23	168	70	47	+23	20
148	77	49	+28	16	169	46	53	-7	28
149	75	81	-6	29	170	71	72	-1	19
150	71	70	+1	23	171	54	35	+19	24
					172	56	53	+3	26
					173	60	65	-5	22
					174	56	38	+18	22
					175	51	53	-2	24

Table 20: Standard Deviations for Teacher Estimates in Eleventh Grade Geometry

1984 Geometry Grade 11									
Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
20	80	89	-9	22	41	74	71	+3	21
21	62	29	+33	23	42	53	64	-11	24
22	61	38	+23	21	43	61	67	-6	24
23	80	71	+9	23	44	57	56	+1	22
24	72	39	+33	21	45	41	67	-26	21
25	73	65	+8	20	46	51	40	+9	23
26	78	75	+3	20	47	62	49	+13	23
27	69	67	+2	24	48	63	42	+21	22
28	70	61	+9	21	49	58	62	-4	24
29	64	37	+27	22	50	41	20	+19	23
30	69	58	+11	23	51	54	58	-4	23
31	56	50	+6	23	52	64	43	+19	26
32	63	49	+14	24	53	50	44	+6	26
33	77	73	+4	21	54	57	36	+21	23
34	63	45	+18	23	55	42	35	+7	24
35	54	37	+17	23	56	43	38	+5	25
36	52	35	+17	24	57	52	29	23	23
37	63	44	+19	24	58	67	56	+11	23
38	59	51	+8	24	59	44	46	-2	25
39	70	67	+3	22	60	35	39	-4	22
40	67	51	+16	24	61	56	60	-4	25
					62	56	43	+13	26
					63	33	39	-6	24
					64	59	43	+16	25

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Table 21: Standard Deviations for Teacher Estimates in Eleventh Grade General Mathematics

1984 General Mathematics Grade 11									
Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.	Item #	Teach Est.	Student Score	Difference	Teach Est. S.D.
138	87	85	+2	12	162	56	59	-3	19
139	70	36	+34	17	163	62	60	+2	19
140	74	74	0	18	164	63	75	-12	19
141	61	86	-25	24	165	54	37	+17	22
142	64	63	+1	19	166	59	60	-1	22
143	70	48	+22	18	167	59	46	+13	20
144	76	73	+3	16	168	48	48	0	20
145	78	58	+20	16	169	64	52	+12	20
146	60	59	+1	20	170	61	49	+12	19
147	58	45	+13	20	171	49	73	-24	23
148	60	65	-5	19	172	66	54	+12	18
149	69	48	+21	19	173	57	77	-20	21
150	59	57	+20	19	174	64	74	-10	21
151	79	78	+1	15	175	67	56	+11	18
152	78	63	+15	17	176	58	31	+27	21
153	59	65	-6	20	177	53	64	-11	20
154	73	60	+13	19	178	49	51	-2	23
155	55	47	+8	22	179	67	67	0	19
156	59	54	+15	18	180	54	63	-9	24
157	71	73	-2	20	181	53	52	+1	22
158	65	75	-10	21	182	59	46	+13	23
159	52	51	+1	21	183	38	64	-26	23
160	67	65	+2	19	184	49	30	+19	23
161	49	42	+7	22	185	48	46	+2	22
					186	61	80	-19	24

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Table 22: Correlations Between Teacher Estimates and Student Performance in Eighth Grade Geometry

Item #	Correlation of Teacher Estimate with Student Performance	r^2	e^2	Item #	Correlation of Teacher Estimate with Student Performance	r^2	e^2
23	.25	.06	.94	45	.48	.23	.77
24	.32	.10	.90	46	.18	.03	.97
25	.41	.17	.83	47	.16	.03	.97
26	.21	.04	.96	48	.11	.01	.99
27	.44	.19	.81	49	.31	.10	.90
28	.20	.04	.96	50	.12	.01	.99
29	.32	.10	.90	51	.19	.04	.96
30	.32	.10	.90	52	.01	.00	1.00
31	.11	.01	.99	53	.18	.03	.97
32	.40	.16	.84	54	.08	.01	.99
33	-.06	.00	1.00	55	.08	.01	.99
34	.15	.02	.98	56	.19	.04	.96
35	.31	.10	.90	57	.05	.00	1.00
36	.26	.07	.93	58	-.03	.00	1.00
37	.28	.08	.92	59	-.12	.01	.99
38	.40	.16	.84	60	.00	.00	1.00
39	.41	.17	.83	61	-.04	.00	1.00
40	.16	.03	.97				
41	.19	.04	.96		$\bar{r}$	$\bar{r}^2$	$\bar{e}^2$
42	.40	.16	.84		$\bar{r}$=.20	$\bar{r}^2$=.04	$\bar{e}^2$=.96
43	-.02	.00	1.00				
44	.46	.21	.79				

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